REMARKS

Claims 61 and 81 are amended and Claims 90-101 are added. Claims 61-101 remain in the application. No new matter is added by the amendments to the claims.

The Rejections:

In the Office Action, dated June 15, 2006, the Examiner rejected Claims 61, 63, 65, 67, 69-73, 77, 79-82, 86, 87 and 89 under 35 U.S.C. 103(a) as being unpatentable over Takeo (US Patent 4,721,630) in view of Yamamoto (US Patent 5,240,745) and Pearce (US Patent 4,781,517).

As to Claim 72, the Examiner stated that Takeo discloses a modular apparatus for performing a process on an object having an upper surface and sides conveyed to and from a location, comprising a pair of frame rails (items 11, see Figure 1) extending on opposite sides of a location and generally parallel to a path of conveyance of an object through the location, at least one robot arm (items 51 and 52) mounted on an associated on of each of the frame rail, and a tool mounted on each of said at least one robot arms for performing a process on the object whereby the at least one robot arms move the tools relative to the object enabling the tools to perform processes on the objects. The robot arms are movable along the frame rail and pivotable at a shoulder axis. The Examiner admitted that Takeo does not discloses that there are at least two legs attached to each of the frame rails for supporting the frame rails above a plane of an upper surface of the object at the location, and at least one cross support member fixedly connecting the frame rails together to from a rigid structure with legs. The Examiner further stated that Yamamoto (especially with reference to Figure 15) discloses that it is known to elevate painting robots by placing them on cross support members (item 572) on elevated frame rails (item 518) mounted on legs (items 94a(b), 94c(d), and 38 - best seen in Figure 16). According to the Examiner, the cross support member connects the frame rails, forming a rigid structure with legs and one in the art would appreciate that elevated positioning would enable better coating of the roof of the car body, while still maintaining the capability of coating the sides of the car body.

The Examiner admitted that Yamamoto does not place the robots on the frame rails. According to the Examiner, Pearce discloses a modular apparatus with robots being extendable below the frame rails for performing a process on an object conveyed to and from a location

comprising a pair of frame members (see Figure 2, which discloses a fixed frame and a single robot attached to the two fixed frames) extending on opposite sides of a location and general parallel to a path of conveyance of an object through the location, at least two legs (items 13, 18, 19 and 20 in Figure 2) attached to each of the frame rails for elevating the frame rails above a plane of an upper surface of the object at the location, at least one cross support member (item 23 in Figures 2) connecting the frame members together to form a rigid frame structure with the legs, at least one robot arm (items 71 and 114) mounted on an associated one of the frame members, and a tool mounted on the at least one robot arms for performing a process on the object whereby the at least one robot arms move the tools relative to the object enabling the tools to perform processes on the object. The Examiner stated that Pearce further discloses, as shown in figure 2, that both frame rails are fixed as claimed and that placing the robots on the frame rails in opposed configuration as in Pearce would enable symmetrical process of a car body and better processing or coating reach of the car roof as in Yamamoto. According to the Examiner, the cross support both Pearce and Yamamoto would reduce the possibly of collapse by improving structural support and, therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized movable robots mounted on fixed elevated frame rails mounted on fix legs in order to provide better coating reach of the car roof and to have utilized a cross support in order to provide structural support.

As to Claims 73 and 77, the Examiner stated that Takeo discloses that each robot arm is a 6-axis robot with a wrist implement, with the non-wrist component of the arm having 3 axes, including axes for defining a generally vertical planar operating space, and the wrist component being connected to the free end of the arm and the tool, the wrist component having 3 axes (column 6, lines 48-64).

As to Claims 79 and 80, the Examiner stated that Takeo discloses 6 axes of motion, including the four claimed, and the multiple axes of Takeo allow the shoulder axis to be offset as claimed.

As to Claim 61, the Examiner stated that Takeo, as modified by Yamamoto and Pearce and applied to claim 1 above discusses the pair of frame rails mounted on opposite sides and extending generally parallel to the path of movement of the object (Takeo and Pearce), the frame rails being elevated above a plane of an upper surface of the object (see Pearce and Yamamoto),

the frame rails being connected together in a rigid frame structure (Pearce and Yamamoto), at least one robot arm mounted on an associated one of each of said frame rails (Takeo), and that the robot arm is movable along the associated frame rail (Takeo and Pearce), and that both frame rails cannot move relative to each other, and both frame rails do not move relative to said frame (Pearce). The Examiner stated that Takeo further discloses that each robot arm has at least two axes of motion for movement in a generally vertical plane transverse to the path of movement of the object (see column 6, lines 48-64), and these axes are considered to be shoulder and elbow axes, and Takeo also discloses that the tool is a paint applicator (bell type atomizers 5f) mounted on each of the at least one robot arms (items 51 and 52) and the arms move the paint applicators relative to the object while the paint applicators dispense paint to cover the upper surface and side surfaces of the object with paint.

As to Claim 81, the Examiner stated that Yamamoto as incorporated discloses generic control means (see Figures 14A, 14B, and 14C), which are capable of performing the claimed movements and, additionally, the apparatus of Takeo is capable of performing the functions as claimed.

As to Claim 63, the Examiner stated that the robots of Takeo, Yamamoto and Pearce are capable of moving as claimed.

As to Claims 65 and 86, the Examiner stated that Pearce as incorporated discloses that the frame rails are mounted on floor engaging legs (see Figure 2).

As to Claims 67 and 87, the Examiner stated that Pearce discloses that the frame rails are connected by at least one cross support member elevated above the plane of the upper surface of the object.

As to Claims 69 and 82, the Examiner stated that both Pearce and Takeo disclose opposed symmetric robot designs. Takeo as incorporated discloses the capability of symmetric painting.

As to Claim 70, 71 and 89, the Examiner stated that Takeo discloses 6 axes of motion, including the four claimed, and the multiple axes of Takeo allow the shoulder axis to be offset as claimed (column 6, lines 48-64).

The Examiner rejected Claims 74 and 83 under 35 U.S.C. 103(a) as being unpatentable over Takeo, Yamamoto, Pearce, and further in view of Thome (US Patent 5,744,190). The

Examiner admitted that the references as applied above are silent as to the robot arms including a process controller mounted for movement therewith along the associated frame rail. The Examiner stated that Thome discloses that it is known to include process controller (control systems 109a) within the robot bodies, Thome utilizes the process controllers in conjunction with sensors for robot feedback, and one in the art would appreciate that the close proximity of the control device to the sensors reduces the amount of wiring needed between the process control and the sensor, and, therefore, it would have been obvious to one of ordinary skill in the art to have utilized such process controls in order to reduce wiring between the robot feedback mechanism and the process control. Furthermore, such a placement would result in the system being mounted for movement along the associated frame rail in the context of the robots used in Takeo (as modified by Yamamoto and Pearce).

The Examiner rejected Claims 75 and 88 under 35 U.S.C. 103(a) as being unpatentable over Takeo, Yamamoto, Pearce and Thome, and further in view of Cebola (US Patent 5,738,727). The Examiner admitted that Takeo, Yamamoto, Pearce, and Thome as applied above do not disclose that the cross support member is tubular for receiving cables and conduits connecting the process controllers together. The Examiner stated that Cebola discloses that it is known to make structural elements hollow or tubular for receiving cables and conduits connecting the process controllers together, that Cebola discloses that shielding these cables protects from electrostatic fields and charges (see column 7, lines 37-45) and, therefore, it would have been obvious to one of ordinary skill in the art to make cross beams and support elements tubular or hollow for receiving cables and conduits in order to protect the cables and conduits from electrostatic effects and charges.

The Examiner rejected Claim 76 under 35 U.S.C. 103(a) as being unpatentable over Takeo, Yamamoto, Pearce and Thome, and further in view of Neikter (US Patent 5,296,026). The Examiner admitted that Takeo, Yamamoto, Pearce, and Thome do not suggest that at least one cross support member is tubular and purged with an inert gas or air for explosion protection. The Examiner stated that Neikter discloses that it is known for the cross support (item 20) to have a gas permeable tubular element (item 22) surrounding the cross support for generating a positive pressure (see column 4, lines 12-29), that Neikter also discloses that the gas presented to the room can be an inert gas such as argon (see column 5, lines 10-17), and that one in the art

would appreciate that this would protect the robots from explosion and prevent chemical interactions with the paint material and, therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized cross supports which spread inert gas in order to protect the robots from explosion and prevent chemical interactions with the paint material.

The Examiner rejected Claims 64 and 85 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeo, Yamamoto and Pearce, and further in view of Josefsson (US Patent 5,766,355). The Examiner admitted that Takeo, Yamamoto, and Pearce do not suggest that the frame rails are mounted on walls of a paint booth extending generally parallel to the path of movement, but Takeo, Yamamoto, and Pearce have been applied to show the frame rails. The Examiner stated that Josefsson discloses that it is known to have painting robots mounted inside of a paint booth, that Josefsson discloses that the use of such a paint booth confines the paint to the chamber, and facilitates collection of the paint overspray (see column 2, lines 40-61), that Josefsson discloses that collection of the overspray in a paint booth allows for the later reapplication of the excess paint to subsequent automobiles (see column 3, lines 29- 43), which one in the art would immediately recognize as reducing material costs and, therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized a paint booth with walls (as in Josefsson) in conjunction with the frame rail robot design (of Takeo, Yamamoto and Pearce) in order to confine the paint overspray and facilitate paint re-use, thus reducing paint material costs.

The Examiner rejected Claims 66 and 68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeo, Yamamoto and Pearce, and further in view of Cebola (US Patent 5,738,727). The Examiner admitted that Takeo, Yamamoto, and Pearce do not disclose that either the frame rails are tubular, or the frame rail and cross support member are tubular. The Examiner stated that Cebola discloses that it is known to make structural elements hollow or tubular for receiving cables and conduits connecting the process controllers together, that Cebola discloses that shielding these cables protects from electrostatic fields and charges (see column 7, lines 37-45) and, therefore, it would have been obvious to one of ordinary skill in the art to make cross beams and support elements tubular or hollow for receiving cables and conduits in order to protect the cables and conduits from electrostatic effects and charges. The Examiner further

stated that Cebola discloses coupling conduits stored with the structural elements (see Figure 4, items 224 and other items).

The Examiner rejected Claims 62 and 84 under 35 U.S.C. 103(a) as being unpatentable over Takeo, Yamamoto, Pearce, and further in view of Hohn et al (US Patent 4,896,274). The Examiner admitted that Takeo does disclose a 6-axis robot with three of the axes being in a wrist mounting, but stated that Takeo is silent as to the capabilities or movements of the 3-axis wrist mounting, and one would expect any conventional 3-axis wrist mounting to be used. The Examiner stated that Hohn discloses a known 3-axis wrist mounting (item 27), for use in either adhesive application or paint spraying (column 3, line 36) in automobile industries, which is part of a larger, 6-axis robot, similar to that in Takeo, that Takeo discloses two tilting axes (at pivot points 28 and 30), and a rotating axis (at point 32, as see column 3, line 65 to column 4, line 16 for discussion of the movements), that Hohn recites that these three axes are intended to effect control over the orientation of the tool carried by the manipulator (or robot) with respect to a relocatable point of reference and, therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized a wrist having a rotating axis and a tilting axis as in Hohn in order to effect control over the orientation of the tool carried by the manipulator (or robot) with respect to a relocatable point of reference.

The Cited References:

Takeo shows an apparatus for painting the inner panel portions of vehicle body front and rear lids and doors using front and rear painting robots. The Takeo apparatus moves a vehicle body **W** to a painting stage **A** positioned between first and second railway means **11** mounted on a floor at the painting stage **A**. The rails **11** are positioned well below the bottom of the vehicle body **W**, as seen in Fig. 2, as are tables $\mathbf{12_1}$, $\mathbf{12_2}$ movable along the rails and carrying robots $\mathbf{5_1}$, $\mathbf{5_2}$ respectively.

Yamamoto shows, in Figs. 15 and 16 referenced by the Examiner, a painting apparatus **500** that has floor mounted rails **518a**, **518b** positioned on opposite sides of a path of travel of a vehicle body **522**. The vertical posts **38** move along the rails **518a**, **518b** and support opposite ends of a painting mechanism **520** that has a plurality of paint spray guns **574a** through **574i** mounted on a horizontal arm **572**.

Pearce shows, in Fig. 2 referenced by the Examiner, four vertical posts **13**, **18**, **19** and **20** supporting a frame **21** formed by two lateral members **22** attached to two transverse members **23**. A bridge member **24** has opposite ends **43** movable supported on the transverse members **22**. A robot carriage **71** is mounted for movement along the bridge member **43** transverse to the path of travel of a vehicle body **50**.

Thome shows floor mounted painting robots connected to controllers.

Cebola shows a roof machine having paint sprayers connected to conduits and cables for coating product, air and electric current wherein the conduits and cables are housed in a beam carrying the sprayers.

Neikter shows painting "automatics" **5**, **6** enclosed in flexible, gas-permeable material enclosures **12**, **22**. The enclosures **12**, **22** are pressurized such that part of the air flows out to repel paint particles.

Josefsson shows a paint spray booth for the application of powder paint from fixed applicators **104a**, **104b**, **214**, **314**.

Hohn shows a robot with an adhesive material dispensing gun **120** mounted on a wrist **27** having three axes of motion.

Applicants' Response:

As an initial matter, Applicants note that Claim 78 is not listed or discussed in the "Claim Rejections" section beginning on Page 2 of the Office Action.

Applicants amended Claim 61 to clarify that the frame rails are located on opposite sides of the path and are fixedly mounted on the rigid frame structure that prevents movement of the frame rails relative to each other and that the robot arms are slidably movable along the frame rails. Applicants amended Claims 61 and 81 to clarify that the shoulder axis and the elbow axis permit movement only in a generally vertical plane.

The Examiner **failed to address** the limitation "that the shoulder axis is positioned below the associated frame rail" in the rejection of Claims 61, 72 and 81 under 35 U.S.C. 103(a) as being unpatentable over Takeo, Yamamoto and Pearce. Applicants' Claim 61 defines "a first and a second robot arm mounted on an associated one of each of said frame rails, each of said first and second robot arms being movable along said associated frame rail and having a shoulder

axis and an elbow axis for movement in a generally vertical plane transverse to the path of movement of the vehicle body, said shoulder axes being positioned below said associated frame rail". Independent Claims 72 and 81 also contain the limitation that the shoulder axis is positioned below the associated frame rail.

Takeo shows a painting robot $\mathbf{5_1}$, $\mathbf{5_2}$ having a shoulder axis above the rail **11**. Yamamoto doesn't show a robot arm and Pearce shows a robotic that does not have a shoulder axis.

All of the rejections include Takeo in view of Yamamoto and Pearce. This combination of references does not show or suggest the following elements recited in Applicants' independent Claims 61, 72 and 81:

1) A pair of frame rails located above a plane of an upper surface of the vehicle body as the vehicle body travels the path (Claims 61, 72 and 81). Takeo and Yamamoto show frame rails mounted below the lower surface of the vehicle body. Pearce shows elevated frame rails. However, if the Pearce elevated frame rails were substituted for the Takeo frame rails, the Takeo painting robots could not reach the inner panel portions of the doors to perform their intended tasks.

2) The frame rails are connected together in a rigid frame structure that prevents movement of one of said frame rails relative to another of said frame rails, prevents movement of said frame rails relative to said plane, and minimizes a width of said rigid frame structure relative to a width of the vehicle body (Claims 61 and 72). The frame rails in Takeo are not connected together and there is no way to connect them because the conveyor is between them.

3) At least two legs attached to each said frame rail for supporting said frame rails above a plane of the upper surface of the vehicle body on the path (Claim 72). As stated above, Takeo shows frame rails mounted below the lower surface of the vehicle body. If the Pearce elevated frame rails were substituted for the Takeo frame rails, the Takeo painting robots could not reach the inner panel portions of the doors to perform their intended tasks.

4) At least one cross member fixedly connecting said frame rails together as a rigid frame structure that prevents movement of said frame rails, fixes said frame rails relative to one another and to said plane, and minimizes a width of said rigid frame structure relative to a width of the vehicle body (Claim 72). As stated above, the frame rails in Takeo are not connected together and there is no way to connect them because the conveyor is between them.

5) A first and a second robot arm (at least one robot arm) mounted on an associated one of each of said frame rails, being movable along said associated frame rail and **having a shoulder axis being positioned below said associated frame rail** (Claims 61, 72 and 81). Takeo, Yamamoto and Pearce do not show a robot arm with a shoulder axis positioned below the frame rail.

6) a paint applicator mounted on each of the robot arms whereby the robot arms move the paint applicators to dispense paint to cover the upper surface and adjacent side surfaces of the vehicle body with the paint (Claims 61, 72 and 81). The robot arms in Takeo are configured to only paint the interior surfaces of the doors. Yamamoto shows a bridge-like painting mechanism; not a robot arm. Pearce shows a robot carriage, not a robot arm, and does not involve painting.

7) Control means connected to each of said first and second robot arms for selectively dispensing the paint in a normal mode wherein different areas of the upper surface and the adjacent side surface are covered by said paint applicators of each of said first and second robot arms and a degraded mode wherein the upper surface and the adjacent side surface are covered by said paint applicator of one of said first and second robot arms (Claim 81). None of the references suggests controlling robots to paint in a normal mode and a degraded mode as recited in Claim 81.

Thome shows floor mounted painting robots, similar to Takeo, connected to controllers, but does not provide any of the missing elements.

Cebola shows a roof machine, similar to Yamamoto, having paint sprayers connected to conduits and cables for coating product, air and electric current, but does not provide any of the missing elements.

Neikter shows wall mounted painting robots and a roof machine, but does not provide any of the missing elements.

Josefsson shows a roof machine and wall mounted spray applicators, but does not provide any of the missing elements.

Hohn shows a robot with an adhesive material dispensing gun mounted on a wrist having three axes of motion, but does not provide any of the missing elements.

In summary, none of the rejections is supported by the cited references.

New independent Claim 90 is similar to Claim 61 but adds a carriage for each of the robot arms, mounting means for a paint applicator, three parallel axes of movement of the robot arms and a paint applicator. This claim is supported by Figs. 1, 2 and 6 and the associated descriptions.

New independent Claim 91 is similar to Claim 90 but adds a control system and incorporates the frame structure with the guide rails, the carriages, the robot arm links and process tools in a robot. This claim and dependent Claims 92-97 are supported by Figs. 1, 2 and 6 and the associated descriptions.

New independent Claim 98 is similar to Claim 91 but separates the "robot" into the individual elements. This claim and dependent Claims 99-101 are supported by Figs. 1, 2 and 6 and the associated descriptions.

In view of the amendments to the claims and the above arguments, Applicants believe that the claims of record now define patentable subject matter over the art of record. Accordingly, an early Notice of Allowance is respectfully requested.